

Advancing Resource Management at General Dynamics Defense Systems (Pittsfield, MA)

1. OVERVIEW

General Dynamics (GD) is a manufacturing contractor with leading market positions in business aviation, information systems, shipbuilding and marine systems, and land and amphibious combat systems. The Falls Church, Virginia based company employs approximately 46,000 people worldwide, and has four main business divisions: Aerospace, Combat Systems, Information Systems and Technology, and Marine Systems. Each of these business divisions is considered a separate operational unit, and contracts independently for its required support services, with few corporate-wide purchasing arrangements available.

This case study focuses on the Information Systems and Technology division of General Dynamics, which provides systems integration services for sea, air and land defense systems. As an operating sub-unit located in Pittsfield, Massachusetts, General Dynamics Defense Systems (GDDS) employs approximately 1,000 persons in providing software development and electronics systems design and integration for aircraft and military (primarily naval) applications. It also provides telecommunications solutions and data management services for the commercial market.

2. BASELINE SOLID WASTE AND RECYCLING SERVICES AND LEVELS

Over the last decade, GDDS has transitioned from a focus on heavy manufacturing to its current function emphasizing systems integration. As a result, waste streams have decreased significantly, and the waste profile has become more comparable to that of typical light manufacturer. The GDDS site consists of three buildings, OP-1, OP-2, and OP-3, which house engineering/test labs and offices. GDDS receives waste hauling/disposal, and mixed paper and corrugated cardboard recycling (Table 1). GDDS also recovers other materials (e.g., batteries, steel, electronics) through various other arrangements that are not specifically evaluated in this analysis. In addition to these formal solid waste and recycling services, GDDS employees have initiated more informal, “grassroots” programs such as a toner cartridge return, a polystyrene packaging “peanuts” reuse program, and an initiative to provide surplus materials to charitable organizations.

There are five players involved in handling, internal transport, and disposal/ processing of trash and recyclables (Table 1):

- **GDDS employees** must actively seek white paper 55-gallon bins in which to empty their desk-side bins when full. For other fiber types, employees use “security paper” lock-boxes, mixed paper, and corrugated cardboard totes located throughout the three buildings. This makes the employees key players in this system, since net recycle rates are heavily dependent on their involvement and participation.

- **GDDS' custodial contractor** is responsible for collection and consolidation of trash from small desk-side containers under desks. From there, it is placed into a 6-cubic yard bin, awaiting transfer by GDDS Maintenance to one of two compactors. Another duty is transfer of white paper from the 55-gallon bins to one of several 4-cubic yard dumpsters located throughout the facility. The custodial service is also tasked with consolidating corrugated cardboard at five central locations in the two buildings.
- **GDDS Maintenance** is responsible for movement and processing of white paper, trash, and corrugated cardboard that has been consolidated by the custodial service and GDDS employees. For white paper, Maintenance transports the intermediate dumpsters¹ to the designated area in OP-2, where it shreds and bails this paper as needed. Maintenance also brings trash and corrugated cardboard consolidated by the custodial service to compactors, and is responsible for calling trash, white paper, and corrugated cardboard contractors for service when compactor capacity is reached (Table 1). Other Maintenance functions involve consolidating and transferring wood to an open container for service by the trash contractor, and bringing mixed paper bins to one of two central areas (one in OP-1 and one in OP-2) for monthly pick-up by the mixed paper contractor.
- **GDDS security** plays a role in removing and transporting "secure bins" containing classified papers to a local incinerator, where it oversees burning by the trash contractor.
- **Contractors** -- one provides trash hauling/incineration and corrugated cardboard hauling, while two other contractors are responsible for white paper and mixed paper hauling/recycling, respectively.²

For its main trash services, GDDS leases two 35-yard compactors and a 6-yard dumpster for cafeteria waste. Approximately 209 tons of trash was managed under this service in calendar year (CY) 2000. Two additional trash services exist. Wood generated by GDDS was at one time recycled, but cross-contamination with other materials was a problem for the recovery company, and the program was discontinued. As a result, there is a separate trash contract for wood hauling and incineration, which includes the lease of one 40-yard roll-off container. This service handled just over 31 tons of wood in CY2000. In the last of its trash services (all through the same contractor), GDDS supplies 42 secure bins for disposal of confidential and classified documents (primarily white paper). GDDS security periodically collects and hauls this material to the local incinerator and supervises the burning process. It is estimated that approximately 20 tons of "security" white paper was incinerated in 2000. In total, 267 tons of material was managed as trash in CY2000 (Figure 1). All waste is burned at a local waste-to-energy incinerator.

¹ Used by custodial service for consolidation.

² The mixed paper contractor also recycles corrugated cardboard that is transported by the trash contractor.

For its white paper recycle program, the contractor picks up shredded and bailed paper from a central area on an “as needed” basis. Approximately 31 tons of white paper was managed in CY2000 under this contract.

Another contractor supplies twenty 50-gallon bins (7 in OP-1, 13 in OP-2) for mixed paper recycling. GDDS Maintenance brings these to the central staging areas, and the contractor picks-up the bins approximately every six weeks, depositing empty bins for distribution throughout the two buildings. Approximately 10 tons of mixed paper was managed under this contract in CY2000.

For corrugated cardboard, GDDS leases a 35-yard cardboard compactor from its trash contractor, which services the compactor on an “as needed” basis, transporting the cardboard to the same contractor responsible for mixed paper recycling. Nearly 12 tons of corrugated cardboard was diverted in this way in CY2000.

Figure 1: GDDS Waste/Recycling Profile, CY2000

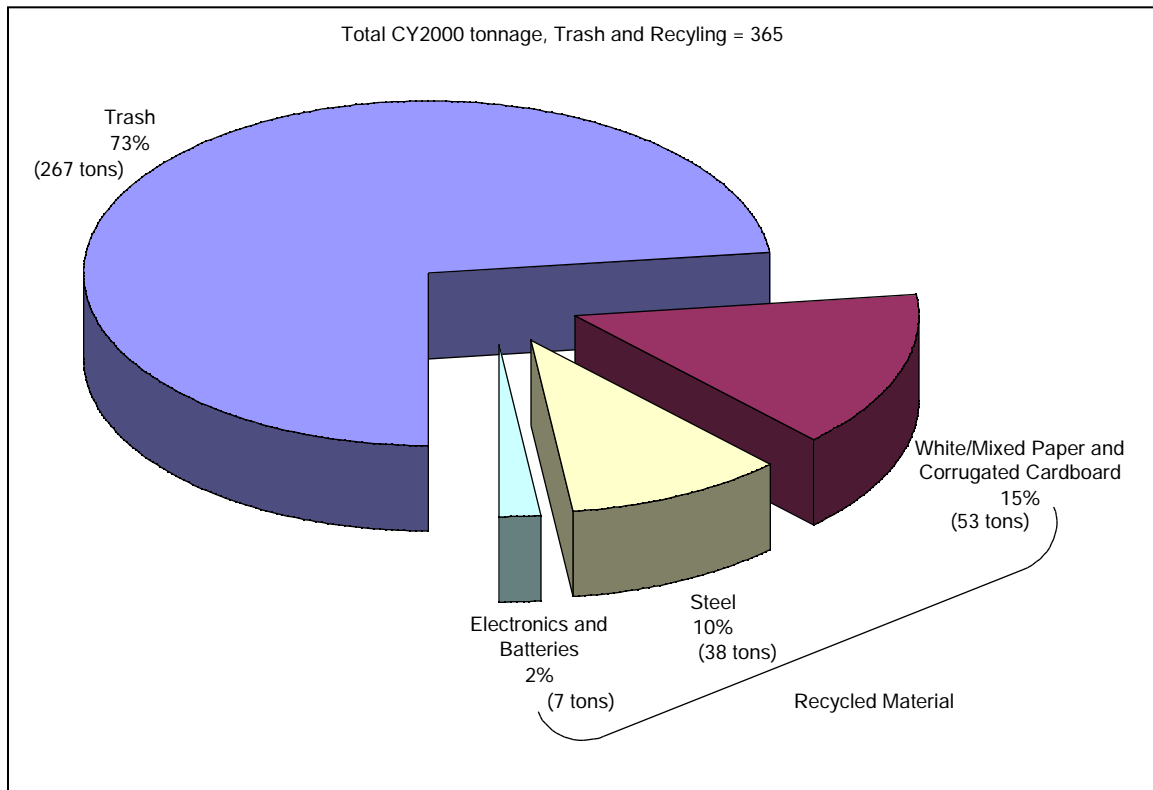


Table 1: GDDS Trash and Recycling Service Summary, CY 2000

Service	Targeted Material	Players (Responsibilities)	Weight Managed (tons)	% of resource stream
Trash	(1) Office/Cafeteria waste	<ul style="list-style-type: none"> Custodial staff (consolidation) GDDS maintenance, (intermediate transport*, contractor service request for office trash, cafeteria waste is picked up every Mon, Wed, Fri) Trash contractor (hauling, incineration) 	209	73%
	(2) "Security" paper	<ul style="list-style-type: none"> GDDS employees (internal transport) GDDS security (transport, oversight) Trash contractor (incineration) 	~20	
	(3) Wood	<ul style="list-style-type: none"> GDDS maintenance (transport, contractor service request) Trash contractor (transport, incineration) 	38	
White Paper Recycling	High-grade office paper	<ul style="list-style-type: none"> GDDS employees (internal transport) Custodial staff (consolidation) GDDS maintenance (transport of dumpster, shredding and bailing, contractor service request) White paper contractor (hauling, recycling) 	31	9%
Mixed Paper Recycling	All grades of recyclable paper	<ul style="list-style-type: none"> GDDS employees (internal transport) Mixed paper contractor (hauling, recycling) 	10	3%
Cardboard Transport (to mixed paper recycler)	Corrugated Cardboard	<ul style="list-style-type: none"> GDDS employees (material drop-off) Custodial service (internal transport) GDDS maintenance (internal transport, contractor service request) Trash contractor (transport for processing to same contractor that handles mixed paper) 	12	3%
Miscellaneous	Steel, Electronics, and Batteries	<ul style="list-style-type: none"> GDDS maintenance, various vendors 	45	12%
Tonnage/% Managed (Trash and Recycle)			365	100%
Tonnage/% Recycled			98	27%

* This denotes transport of materials from custodial consolidated containers to other containers serviced by the responsible contractor.

3. BASELINE CONTRACTS AND COMPENSATION

Table 3 summarizes GDDS contracts for each of the services outlined in Table 1. Like many organizations, GDDS employs a simple bid process for trash hauling and disposal contracting. Locations and estimated service requirements are provided to prospective contractors who submit monthly and annual price bids on that basis. Under the current arrangement, GDDS pays a flat per haul fee, a tonnage-based incineration charge, and a monthly fee for rental of the various compactors and containers for the wood and office/cafeteria trash contracts. There are also tonnage-based charges for incineration of security paper. Specific information in this regard was not released to Tellus because it is considered confidential/sensitive, and therefore could not be substantiated. However, the total amount paid on all trash contracts (i.e., office/cafeteria trash, wood, and "security paper", including all applicable fees) in 2000 was \$60,883 on 267 tons managed (Table 3), equivalent to \$228 per ton. Independent contracts for disposal of wood and security

paper also creates widely divergent costs per ton managed (Table 3), and higher costs associated with contract management.

Three separate contracts cover recycling of white paper, colored paper, and corrugated cardboard hauling:

1. GDDS contracts for pick-up of shredded and bailed white paper, and pays a tonnage fee for this service, but receives a percentage of value for the paper that varies with market prices. Specific contract payment data were not available; however, this arrangement brought \$6,214 in net revenue (an average of \$200/ton) for GDDS in 2000.
2. A different company is contracted for colored paper recycling service, for which GDDS pays the equivalent of \$244 per ton, which includes a rental fee for its bins and a monthly pick-up fee. There is no revenue distribution arrangement under this contract.
3. GDDS' waste hauler is paid the equivalent of \$20 per ton for hauling corrugated cardboard to a recycling operation and for lease of a compactor used for cardboard. GDDS again receives no revenue for this material.

Table 2 presents an estimate of GDDS labor costs for internal handling, shredding, and bailing of white paper and for trash consolidation. Other GDDS labor costs for trash (secure burn and wood program), and recycling (corrugated cardboard and mixed paper tote handling) were not available. An RM contract may be one way to reduce these costs if the contractor can perform the tasks more efficiently, or simplify the process. For white paper, labor cost estimates include custodial time for consolidation (3 hours/day), and GDDS Maintenance labor for transport, shredding and bailing (2 hours/day). For waste, labor cost estimates include custodial time for daily waste consolidation (12 hours/day) and GDDS Maintenance labor for transport from intermediate dumpsters to the compactors (2 hours/day). Equipment costs for shredders and bailers are excluded, since this equipment is owned by GDDS.

Table 2: Estimated GDDS White Paper and Trash Labor Costs

Labor Costs	Person hours/day	Person hours/year (355 days)	Tons handled/ year*	Person hours/ ton	\$/ton (assumes \$25/hour)
White paper	5	1775	31.0	57.3	\$1,431.45
Trash	14	4970	209.4	23.7	\$593.28

* For trash, estimates include only office and cafeteria waste.

Table 3: Contract Cost Summary for GDDS, CY2000

Contract		Payment Structure	CY2000 Contract Cost/ (Revenue)	Tons Managed	Cost (Revenue) Ton
Trash	(1) Office/Cafeteria	Flat per haul, tonnage charge, container rental	\$56,877	209.43	\$272
	(2) Wood Trash	Flat per haul, tonnage charge, container rental	\$1,883	38.11	\$49
	(3) Secure burn	Tonnage charges	\$2,123	Est. 20.00	\$106
White Paper		Tonnage charge, variable market-based tonnage credit	(\$6,214)	31.07	(\$200)
Mixed Paper		Monthly haul fee, container rental	\$2,520	10.31	\$244
Cardboard		Tonnage-based fee, container rental	\$240	11.76	\$20
		Totals	\$57,429	320.68	

4. OPPORTUNITIES FOR COST SAVINGS AND ENHANCED RECYCLING SERVICES

Restructuring and further coordinating its contracts to be consistent with RM practices presents an opportunity for GDDS to achieve higher diversion rates and resource efficiency while maintaining or decreasing waste hauling, disposal, and recycling costs. RM might also minimize GDDS' management time and expense on waste, recovery, and contract coordination issues.

Tables 5 and 6 present three scenarios projecting incremental improvements from GDDS baseline recovery rates for paper and cardboard, which are readily recyclable materials. Current contract costs (and revenues) can be used as a basis to estimate the expected net cost or savings as a result of increased diversion under an RM contract. GDDS' waste stream composition and capture rates were estimated based on minor adjustments to industry waste stream profiles to be consistent with Tellus' understanding of the GDDS enterprise (Table 4). The emphasis in these scenarios is on capturing the "low-hanging fruit" by increasing paper and corrugated cardboard capture rates.

Table 4: GDDS Post-Recycling Waste Stream Fiber Composition Assumptions

Material	% in Waste after Recycling*	Est. Tons Disposed CY2000	Recycled Tons CY2000	Total tons CY2000	Est. CY2000 % Fiber Recycled
White Paper	10.0%	26.7	31.1	57.8	53.8%
Mixed Paper	25.0%	66.8	10.3	77.1	14.4%
Cardboard	7.0%	18.7	11.8	30.5	38.6%
Totals	42.0%	112.2	53.1	165.3	32.2%

* Conservative estimates based on California Integrated Waste Management Board Waste Composition and EPA MSW Factbook (1997).

Table 4 suggests that there are significant amounts of readily recyclable materials currently being disposed of as waste by GDDS, despite more economical recycling options (see Table 3) that could be further optimized using RM to provide additional comparative advantage to recycling and increased resource efficiency. Jointly, avoided disposal costs and recycling revenues exceed the added expense that could be expected to result from higher levels of recycling service (Tables 5 and 6). The most aggressive scenario (#3) represents an increase in the net recycle rate from 27% to 43%. Avoided disposal costs represent the largest portion of the cost savings from this increased diversion. The potential for cost savings from avoided disposal is expected to increase as the local incinerator is privatized and loses subsidization from the State.

Table 5: Effects of Increased Fiber Recycling on GDDS Contract Costs (Revenues)

Material (1)	Scenario Name (2)	Capture Rate of Material (3)	Tonnage of Material Recovered	Avoided Haul/ Disposal Fee (4)	Recycling/ Material Recovery Revenues (Cost) (5)	Total Savings
White Paper	Current	53.8%	31.07	\$6,328	\$6,214	\$12,542
	Scenario 1	60.0%	34.66	\$7,060	\$6,932	\$13,993
	Scenario 2	70.0%	40.44	\$8,237	\$8,088	\$16,325
	Scenario 3	80.0%	46.22	\$9,414	\$9,243	\$18,657
Colored Paper	Current	14.4%	10.31	\$2,100	(\$2,520)	(\$420)
	Scenario 1	20.0%	14.34	\$2,922	(\$3,260)	(\$338)
	Scenario 2	35.0%	25.10	\$5,113	(\$5,232)	(\$119)
	Scenario 3	60.0%	43.03	\$8,765	(\$8,519)	\$246
Cardboard	Current	38.6%	11.76	\$2,395	(\$240)	\$2,155
	Scenario 1	45.0%	13.70	\$2,791	(\$270)	\$2,521
	Scenario 2	55.0%	16.75	\$3,411	(\$316)	\$3,095
	Scenario 3	75.0%	22.84	\$4,652	(\$410)	\$4,242

- (1) Estimated total tonnage of these 3 types of materials generated = 160 tons or 42% of total waste stream (actual current capture = 53 tons or 15% of waste stream) reported CY2000 contract compensation.
- (2) Scenarios were developed based on capture rates for different materials within the different types of organizations, thus capture rates vary by organization. Incremental gains for a material with a relatively high capture rate in one organization would be more modest than for organizations with lower capture rates of the same material. Readily available sector based waste composition data was used to estimate the capture rates. When actual waste composition data was not available California Integrated Waste Management Board standards were used. Scenarios were calculated showing incremental gains for each chosen material. Materials such as paper, cardboard, glass, plastics and organics with readily available secondary markets were chosen.
- (3) Conservative post-recycling estimates based on California Integrated Waste Management Board Waste Composition and EPA MSW Factbook (1997).
- (4) Estimated on cost per ton of \$272 (see Table 3) for office/cafeteria waste assuming variable costs represent 75% of total (25% fixed).
- (5) These are estimated assuming 75% variable net costs, 100% variable revenues based on

Table 6: Summary of Potential GDDS Contract Cost Savings

	Tonnage Material Recovered	Resulting Recycle Rate*	Avoided Disposal Fee	Recycling/ Material Recovery Revenues (Savings)	Total Savings	Savings from Baseline	Savings as % of affected Service Base
Current	53	27%	\$10,824	\$3,454	\$14,278	NA	NA
Scenario 1	63	30%	\$12,773	\$3,403	\$16,176	\$1,898	3%
Scenario 2	82	35%	\$16,761	\$2,540	\$19,301	\$5,023	9%
Scenario 3	112	43%	\$22,830	315	\$23,145	\$8,867	15%

* Includes 45 tons of “miscellaneous” steel, etc. (see Table 1)

Under these scenarios, cost savings of between \$1,900 and \$8,900 are anticipated, representing between 3% and 15% of the affected service base of approximately \$59,600 for applicable trash and fiber recycling contracts. These savings represent estimates of “gain-sharing” that may be distributed in part or entirely to the contractor as part of a restructured compensation package to provide direct financial incentives for resource efficiency.

These scenarios reflect levels of paper and cardboard that may be captured from the GDDS waste stream given conservative assumptions that paper and cardboard represent 42% of the GDDS post-recycling waste stream (Table 4). Other similar types of facilities have characterized waste streams as having a paper and cardboard composition of up to 70%.³ This would represent over \$27,000 in avoided disposal cost over the baseline, or nearly 50% potential increase in value of the base waste/recycling services to the RM contractor.

A final point to note in considering the relative cost of disposal and fiber recycling is the labor intensity and cost. While Table 2 identified higher GDDS maintenance labor costs for white paper than for disposal, the aggregate decrease in trash handling costs would offset cost increases in white paper handling, shredding, and bailing. For example, considering Scenario 3, 112 tons of trash diverted represents over \$68,000 in saved labor costs in the given scenarios, while higher white paper diversion represents labor cost increases of nearly \$21,500 (from 31 tons diverted to 46 tons). Because corrugated cardboard and mixed paper handling and processing are significantly less labor intensive than white paper, it is expected that the above cited trash labor savings in combination with other material handling efficiencies would offset the costs associated with increased diversion of all three fiber types assessed. Mixed paper and corrugated labor should be documented to verify this idea and further assess potential labor cost savings from redesigning elements of the recycling program.

An RM contractor might also identify alternative markets for recycling wood (primarily in form of pallets), or substitute with another more durable or reusable material. Diverting 50% of the current wood being disposed (38 tons in CY2000) by recycling or substitution of reusable pallets and boxes represents an avoided disposal cost of \$2,800,

³ Powelson and Powelson, 1992, *The Recyclers Manual for Business, Government, and the Environmental Community*.

not to mention avoided purchase costs. In addition, the need for a secure burn may be circumvented by consolidating with the white paper shredding program, thereby recovering an additional 20 tons of paper and turning a net cost program (\$2,123 in 2000) into one in which revenue is earned on recovered materials (approximately \$2000 according to 2000 data) for a net savings of over \$4,000.⁴

In addition, there are likely several other materials in the GDDS waste stream that may represent opportunities for an RM contractor to profit from diversion and commodity revenue. These materials include construction and demolition debris, plastic and glass from both manufacturing-related and other sources, such as cafeteria and employee discards. Diverting and finding markets for these materials may represent up to \$14,400 in avoided disposal costs, and potential commodity value from recovered materials (Table 7).

Table 7: Disposal Cost Savings for Other Waste Stream Elements

Material	% in waste currently disposed*	Tons	Avoided haul/disposal cost
Construction and Demolition Debris	8.0%	21.36	\$4,351
Process/Cafeteria Glass	3.5%	9.35	\$1,903
Process/Cafeteria Plastic	15.0%	40.05	\$8,158
Total	26.5%	70.75	\$14,412

* Based on California Integrated Waste Management Board Waste Composition and EPA MSW Factbook (1997) percentages and a post-recycling disposal tonnage of 267 tons.

Taken together, fiber recycling (scenario 3 in Table 5), consolidation of the security paper program into white paper program, and diversion of wood, glass, plastics, and C&D debris, represents a cost savings potential of approximately \$28,000 (or ~50% of the value of current contracts) that could be used to finance the recycling and source reduction initiatives and/or provide contractor incentives.

In the short-term, GDDS might choose to focus on improving fiber capture rates and improving program efficiency. The following are suggestions for achieving higher recycle rates and contract cost savings:

Make diversion more convenient for workers by having the custodial service pick-up mixed paper and white paper recycling at the same time as it collects trash. This would maximize paper diversion by having the contractor collect all paper recyclables at desk-side, removing the onus from GDDS employees. Mixed and white paper diversion is likely not optimized because it relies on employees to empty their own bins into central receptacles. Because mixed paper constitutes a higher proportion of the waste stream, and is currently running an estimated capture rate of 14% (see Table 4) it might make sense to consolidate these programs and adjust service such that both white and colored paper are collected at desk-side. This may

⁴ This possibility is contingent on meeting GDDS client and internal requirements for disposal of classified documents.

include collection of trash, mixed, and white paper separately or commingling of white and mixed paper. This represents a change in recycling program focus from capturing higher resale value white paper to avoiding disposal costs by diverting more mixed paper, which constitutes a higher fraction of the waste stream. Any increase in custodial service costs for such service could be financed by avoided disposal costs and commodity revenues from higher paper recycling.

Internal handling processes provide an opportunity to optimize efficiency. The complexity of the GDDS recycling program and the multitude of players involved (see Table 1) make it difficult to coordinate and optimize work. Understandably, other more pressing management priorities result in lack of attention to this issue. An RM contractor may assist in streamlining and aligning recycling system elements. Furthermore, an RM contractor may be able to perform internal material handling more efficiently as a single point of contract, decreasing the incremental cost per ton managed.

Negotiating or obtaining more favorable rates or gain and risk-sharing agreements⁵ on recycled commodity revenues. For instance, the GDDS trash, mixed paper, and corrugated cardboard service charges are currently quite high compared with industry standards. This analysis does not take into consideration potential gains from revenue sharing agreements, which may further provide incentives for higher recycle rates.

5. REALIZING COST EFFECTIVE RECYCLING AND REDUCTION POTENTIAL WITH RM CONTRACTING

In order to achieve the variety of cost-effective resource efficiency described above, there are several standard practices that can be followed to prepare for and implement an RM contract (Table 8). Each of these stem from findings during the course of this and prior projects regarding: (a) the availability and use of information on current contract pricing structure, payments, and baseline waste management/recycling levels; (b) pre-bid information-gathering tactics, and (c) the nature of the incentives created by current contract pricing structures. Although the practices are somewhat interrelated, the first practice provides the foundation for implementing Practices 2-6.

⁵ These would provide loss assurance in the form of shared costs between the contractor and GDDS when commodity markets are weak, and in strong markets joint revenue (that apportioned to GDDS could be used to fund recycling or source reduction projects, while that to contractor might be used for training in process engineering, for example).

Table 8: Summary of Standard RM Practices

RM Practice	Description	Present
1. Establish Baseline Cost, Performance and Service Levels	Define scope and service levels	X
	Identify existing contract and compensation methods	X
	Establish cost and performance benchmarks and goals	
2. Seek Strategic Input from Contractors	Convene pre-bid meetings with contractors to articulate goals and address questions Allow or require bidders to submit operations plans for achieving specified improvements in existing operations	
3. Align Waste and Resource Efficiency Services	Coordinate, integrate, and formalize all contracts and services included in the baseline scope identified in Practice 1 Ensure that contractor has access to "internal" stakeholders that influence waste management and generation	
4. Establish Transparent Pricing for Services	Delineate pricing information for specific services such as container maintenance, container rental, hauling, disposal, etc. Allow variable price savings, such as "avoided hauling and disposal" to flow back to generator and/or be used as means for financing performance bonuses.	X
5. Cap Compensation for Garbage Service	Constrain waste hauling/disposal service compensation by capping or changing to "on-call service." De-couple contractor profitability from waste generation and/or service levels based initially on reasonable estimates of current hauling and disposal service and costs as per practice 1.	X
6. Provide Direct Financial Incentives for Resource Efficiency	Establish compensation that allows contractor to realize financial benefits for service improvements and innovations. Assess liquidated damages for failing to achieve minimum performance benchmarks or standards.	

Based on the practices identified above, an assessment was conducted to determine the extent to which RM practices were part of existing contracting at GDDS. Those practices that are currently in place (Table 8) are RM practices that are the most mature or best established in GDDS' current contracts and practices. Additionally, there is potential for adoption of remaining RM contracting practices to leverage recycling improvements as a cost neutral (or even cost saving) proposition to GDDS.

1. *Establish baseline cost, performance, and service levels.* The cost and service baseline is reasonably well documented by GDDS staff. Its baseline service levels and pricing structures appear to be well established, although data provided by GDDS did not disclose the exact nature of the payment structure. The information supplied enabled the assessment of estimated potential savings from increased diversion that could be leveraged for contractor performance bonuses under an RM contract. No explicit cost and resource efficiency performance benchmarks or targets were communicated to us.

2. *Seek strategic input from prospective contractors.* Providing diversion goals and soliciting input in the pre-bid period would allow GDDS to explore the extent to which prospective contractors can propose alternative solutions and pricing structures to improve service in an “open”⁶ bid. One issue noted by GDDS was the scarcity of traditional recycling providers and haulers, let alone contractors capable or willing to provide RM service. However, GDDS did not actively seek RM services when soliciting for their latest contracts. Another barrier discussed was the limited size of the GDDS opportunity available to contractors. Because corporate ties are restricted, so are the opportunities for an RM contractor to expand its services to other GDDS facilities, which may limit the appeal of a single facility GDDS account. One solution to this “scale” issue may be to partner with other similar and geographically proximate organizations in order to present a more attractive opportunity for an RM service provider.
3. *Align garbage, reduction and recycling services.* GDDS currently has three trash contracts with separate pricing structures and three recycling contracts for white paper, mixed paper, and corrugated cardboard. These contracts are not fully coordinated and integrated, and as a result, are not fully optimized. Having one point of contact for the management of all waste/recycling contracts would increase management and administrative efficiencies, and designate one individual with the responsibility for overseeing all contracts to ensure cost and resource efficiency is being achieved.

There is also potential to better align white paper and mixed paper programs. In the current system, GDDS employees collect white paper at desk-side and then transport this paper as needed to 55-gallon bins. Providing desk-side white and mixed paper recycling (either commingled or sorted) would align these programs by standardizing consolidation, and achieve higher overall recycle rates. Under an RM contract, a supplier would have a direct interest to act on this as an opportunity to increase profit.

4. *Establish transparent pricing for services.* GDDS has benefited from having suppliers “unbundle” pricing structures to specify hauling on a fixed basis, and disposal on a variable basis (i.e., \$ per ton incinerated). This allows GDDS to more easily assess and negotiate savings on the volume of materials disposed in future contracts. Furthermore, negotiating rates of return on recycled commodities such as cardboard or compost would be advantageous, as GDDS currently receives revenue for only its white paper. These dual savings could be used to finance performance bonuses and/or assess reasonable liquidated damages as described in practice 6. Based on the tonnage data and total contract compensation (Table 3), it would appear that GDDS costs on a tonnage basis are elevated for its trash and colored paper contracts in particular.

⁶ An open specification includes performance-based objectives in place of limiting requirements to location, service level, number of containers and pick-ups exclusively, leaving it open to bidders how they propose to satisfy performance objectives.

5. *Cap compensation for disposal service.* GDDS has effectively limited its trash contractor's ability to profit from ever-increasing garbage service levels by implementing on-call service for its trash compactors. This allows GDDS to realize cost savings from having the contractor service the containers less frequently than for a scheduled pick-up arrangement. Using its baseline hauling cost information, GDDS might in the future negotiate a cap on what it is willing to pay for hauling/disposal service that decreases gradually over time based on reasonable estimates of current and expected service. This may be more practicable within a service purchasing cooperative with other companies interested in RM.
6. *Provide direct financial incentives for resource efficiency.* Savings on avoided hauling and incineration fees and revenues received for recycled commodities (as established in practice 4) could, in part, finance a performance bonus for increased diversion (see Tables 5, 6, and 7). Optimizing recycling involves providing the right incentives to all of the recycling program stakeholders (employees, custodial service, GDDS maintenance, contractors), and revising these incentives as the limits of recycling are reached to further incentives for source reduction.

Looking to the long-term outlook for RM, GDDS management have expressed concern over the constraints of having an RM service provider work further "upstream" within the facilities due to the proprietary and classified nature of their business. Resource Management and source reduction should not be precluded on this basis, as there are several means to address these issues, including confidentiality or non-disclosure agreements.

That issue aside, it is anticipated that GDDS would benefit from administrative and material handling cost savings from having an RM as a single point of contact to manage all services. Providing consolidated incentives that consist of avoided disposal costs and recycling revenues to a single "gatekeeper" RM contractor would simplify and streamline the current program, and advance alignment of waste and a multiplicity of recycling services to achieve GDDS resource efficiency goals.